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DECIPHERING A POTENTIAL TOXIC SYNERGY BETWEEN PERSISTENT ORGANIC POLLUTANTS

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Abstract

Plastic, massively used in everyday life, inevitably accumulates in the environment, becoming a persistent pollutant due to its reduced and/ or extremely slow recyclability[1]. Plastic particles in the micro and nano range, known as micro (MP) and nanoplastics (NP), respectively represent a huge ecotoxicological challenge. Due to their high surface areas, they might ad/absorb other persistent pollutants with similar chemical properties, such as polycyclic aromatic hydrocarbons (PAHs), with unpredictable effects on persistence and distribution in the environment[2]. MPs/NPs, with or without pollutants ad/absorbed, could enter the trophic chain at the level of invertebrates, inflicting toxicological effects through all levels of the ecosystem[3].

Polystyrene MPs and PAHs previously found in water samples (e.g. fluoranthene, phenanthrene)[4] and known to be adsorbed by MPs (Pyrene, benzo(a) pyrene)[5] will be used in the study. PAH's mixtures will be used to mimic environmental samples and single compounds will be used in order to understand the individual contribution of each compound for the observed toxic effect. This experimental approach will also allow to evaluate a potential synergy between compounds with effect on toxicity. Since PAHs and MPs have similar chemical properties, they are known to adsorb to each other. We will use PAHs adsorbed to MPs to test higher concentrations of PAHs (not soluble in aqueous solutions such as cell culture medium) and to document the intracellular distribution of adsorbed versus free PAHs. Concerning MPs only one material will be used at this stage. Polystyrene was selected because it is commercially available in spheres suitable for internalization by HepG2 cells and was previously isolated from environmental samples [4]. This study could contribute to identify differences in toxicity and contribute to the elucidation of the underlying toxicity mechanisms using molecular biology protocols, light/electron microscopy and FTIR micro/spectrometry.

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